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**A SUMMERS STUDY OF HICKORY GALLS,
with descriptions of supposed new insects bred therefrom.**

BY HENRY SHIMER, M. D.

Having observed, in the early part of June 1868, countless numbers of galls on the varieties of Hickory trees in the vicinity of Mt. Carroll, Ills., I was induced to make a careful study of them with a view of settling in my mind, as far as possible, their true relationship. Deeming the results attained thereby sufficiently important to science, I herewith present them to the entomological public.

Synoptical Table of Galls.

1. Galls opening with an elongated slit; containing translucent, whitish eggs.....Nos. 1, 3, 6 and 12.
2. Galls with a rounded opening in an elongate nipple-like tube :
 - a.—Containing translucent, whitish eggs.....Nos. 2, 4, 5, 7, 9 and 11.
 - b.—Containing yellow eggs.....Nos. 8 and 10.

Galls on the Shell-bark Hickory (Carya alba).

- No. 1.—Large, hemispherical, opening beneath,Imago, length .06 in.
- 2.—Flattened, partitioned; opening above and beneath “ “ .06 in.
- 3.—Large, nut-like; on leaf-stem.....“ “ .085 in.
- 4.—Flat; opening beneath,.....“ “ .06 in.
- 5.—Like No. 1, except that the lower part is conical, “ “ .055 in.

Galls on the Bitter-nut Hickory (Carya amara).

- No. 6.—Very large; opening beneath.....Imago, length .08 in.
- 7.—Small; opening beneath, round,.....“ “ .045 in.
- 8.—Small, leathery; opening beneath, winged imago unknown.
- 9.—Medium; opening beneath; a dimpled depression above,Imago, length .06 in.
- 10.—Large, leathery; opening beneath.... “ “ .07 in.
- 11.—Flat, almost like No. 4 but very thick.....“ “ .045 in.
- 12.—Spiny, pubescent, irregular, opening beneath elongate sinuate.Imago length .06 in.

Galls on the Shell-bark Hickory (C. alba).

GALL No. 1. *—This is a large, subhemispherical gall, situate in the parenchyma of the leaf, generally projecting above the plane of the latter. Structure somewhat thick, tough and dense, the average thickness of the walls being about .05 inch. Color pale whitish-green, much paler than the leaf, the upper surface frequently tinged with red and often quite purple-red. Size: diameter in the plane of the leaf, $\frac{1}{4}$ to $\frac{1}{2}$ inch; vertical diameter one-half.

* The description of this and the following galls were made from specimens in their most perfect state of development, and before the maturity of the insect that produced them.

These galls open beneath with a slit, the length of which is about one-third of the diameter of the gall; its direction is usually in, or somewhat oblique to, that of the veins of the leaf, and when oblique, more nearly parallel with the longitudinal axis of the leaf. The lips of these slits are pinched so tightly together as to project out and their margins are either smooth or slightly hairy. Sometimes a leaf contains but a single gall, others two or more. The galls may be scattered irregularly on the leaf, or placed in one or two rows along and near the mid-rib, and one or two dozen may be found in a single row, placed so closely together as to be contiguous.

Upon opening one of these galls, I found the mother insect and her eggs, the latter in great abundance, one hundred or more, studded all over the concave surface; but very few eggs had then (June 7th) hatched. But on opening one of the largest galls, which seemed to be in a much more advanced state, I found the mother insect in the midst of a very numerous brood of newly hatched larvæ, and also many eggs still unhatched; the new-born larvæ were pale greenish-white, while those more advanced were of a deeper color and of all shades approaching to orange; many were already in the pupa state, having short wing-cases. The mother insect moved in a stately manner among her numerous offspring, apparently proud of her queenly position.

On June 18th, the galls were in prime condition for examining the inhabitants; many were opening at the slit beneath and the winged imagos escaping in great numbers. The following is a description of the species. *

***Dactylosphæra hemisphericum*, n. sp?**

? *Phylloxera caryæ-globuli*, Walsh, Proc. Ent. Soc. i, 309.

WINGED IMAGO.—Light orange yellow, head, antennæ, legs, and a band around middle of thorax blackish; abdomen pointed; wings delicate, hyaline; antennæ (viewed with a simple lens, apparently 3-jointed. Length of body .04; to tip of wings .06 inch.

Microscopic view.—Antennæ 5-jointed, the first two, as usual, short and thick; third longer; fourth slender, shorter than third; fifth clavate, longer than third and fourth and about as thick as the third; these joints do not appear so evident in all specimens, as sometimes only four are discernable, and sometimes the microscope separates the antenna on one side into four joints, and that on the other into five. Promusculus slightly hairy, 3-jointed, the middle

*The description of this and the following species were taken from living specimens. In making microscopical examinations, especially of the feet, I find it best to place the *living* insect upon the glass slide, for, when it is *anesthetised* it rests with the claws contracted under the foot and they cannot, therefore, be seen; whereas, when the insect is in motion, the claws and digituli are clearly observable.

joint shortest and thickest, and the third longest. Legs slightly hairy; femora very thick above, slender in the middle, being not half the upper diameter, then swelling out and clavate toward the lower end; feet with one joint, two claws and two digituli, which have clavate ends.

MOTHER INSECT.—Pale greenish-yellow, orange-yellow about the head; antennæ, proboscis and legs black; abdomen pointed, very versatile.

Microscopic view.—A few very short, fine, black hairs scattered over the body; three spiracles are seen along each side; surrounding the femur, there is an inverted conical or bell-shaped cup, bordered with black, within which the limb has room to work freely, and outwardly a frænum or skin attaches the side of this cup to the body, its lower margin black and about as large as the diameter of the cup. Proboscis projecting downwards between the fore legs. Eyes black. Tarsi with one joint, two claws, two long globe-ended digituli, and several hair-like spines. Antennæ 3-jointed, first two joints short and thick, subglobular, the last long and clavate.

PUPA.—Pale orange, wing-pads lighter; eyes brown; ocelli red; feet plainly showing two digituli.

Of the winged imago thousands were observed, each gall containing from thirty to forty specimens. On June 18th, I found no eggs, only a few larvæ and many pupæ.

I am rather suspicious that this may be the *Phylloxera caryæ-globuli* of Walsh; but he says (*ibid.*) that the gall of his species is "spherical," and also that the size of the insect is ".07 to .08 inch in length;" and that the abdomen is blackish. But unless described from living specimens, the color is of no value, as they all turn black after death.

GALL NO. 2.—On the same leaves with the galls described above (No. 1) I found (June 7th) many presenting the following characters: Flattish, opening both above and below, in nipple-like projections, both surrounded by a downy substance, the upper opening being smaller and closer.

On opening the gall by a vertical cut, I observed a partly broken septum in the plane of the leaf, the border of the partition remaining, but the centre gone. A flat, dense, rim-like border extended around this septum into the parenchyma of the leaf, beyond the gall, so that the margins of the cut gall presented quite an acute angle. The greater part of the gall was above the leaf and its cavity was somewhat like two cones, with their bases together at the septum, the upper being much the larger. I opened one gall in which the inhabitants had perished when it was about one-fourth grown; in this the partition was complete. Diameter $\frac{1}{4}$ inch; inside diameter .08 inch; distance between the vertical orifices .15 inch.

Phylloxera caryæ-foliæ, Fitch (2d. N. Y. Rep. § 166), has a somewhat similar gall, but that opens only above, while the one under con-

sideration opens both above and below, the principal opening being beneath.

***Dactylosphæra caryæ-septum*, n. sp.**

WINGED IMAGO.—Light orange-yellow, with a black band around the thorax; the general resemblance being quite similar to the species from gall No. 1. Length of body .04; to tip of wings .06 inch.

MOTHER INSECT.—Pale greenish, slightly yellowish anteriorly; legs, antennæ and some spots on the back, blackish; apex of abdomen obtuse, terminated by a small central point, somewhat emarginate; otherwise like the mother insect from gall No. 1. Length .25 inch; breadth .15 inch.

GALL No. 3.—On June 7th, I observed, placed in the common petiole of the leaf, large, elongate, subelipsoidal, nut-like galls, of a deep leaf-green color, mottled with paler green, and somewhat nodulated; some were irregular, being on the side of the stem; but most of them are quite regular in form, and completely surrounding the stem; in these latter the leaves are very much dwarfed. The opening is on the middle of the side, slightly elongate, but at this date so close as to be scarcely apparent. These galls contain capacious cavities, in which were found vast colonies of larvæ, and an abundance of eggs. Transverse diameter $\frac{5}{8}$ inch; conjugate diameter $\frac{3}{8}$ inch.

By June 20th, these galls had considerably changed in appearance, being contorted into different shapes; they had began to crack open, having transverse fissures on their outer surface. The first one opened contained many hundred winged imagos, all dead, and in the midst of them was a large syrphidian larva. I found only one gall that contained perfect living imagos, the inhabitants of all the other galls that were examined, having been destroyed by various enemies.

***Dactylosphæra subellipticum*, n. sp.**

WINGED IMAGO.—Large and robust, blackish, with abdomen light yellow; antennæ and legs blackish; wings hyaline. Length of body .06—.07; to tip of wings .08—.09 inch.

MOTHER INSECT.—Rugose, greenish-yellow; antennæ and legs black; otherwise like that from gall No. 1. Length .06; breadth .04; thickness .03 inch.

The winged imago of this species is the largest yet observed, and the eggs are more nearly globular than those found in other species of galls.

GALL No. 4.—These galls were found to be exceedingly numerous on some trees. On June 20th, they were smooth, slightly rounded above, pale yellowish-green; beneath somewhat whiter, and having in the centre a nipple-like projection; opening round, surrounded with a burr-like fringe composed of many filaments, the cavity like an inverted cone, the wall above being quite thin and translucent, so that the inmates

may be seen moving about. This apparently very flat gall was placed as much below as above the plane of the leaf. Diameter .15—.25 inch; vertical thickness .125 inch.

Dactylosphæra depressum, n. sp.

WINGED IMAGO.—Yellow; head, antennæ, legs and a band around the thorax, black; antennæ 3-jointed; otherwise as in specimens from gall No. 1. Length of body .04; to tip of wings .06 inch.

GALL No. 5.—A subhemispherical gall, projecting beneath into a conoidal point, with a round opening. On June 21st, these contained a great number of pupæ, and a few winged imagos. The walls are very thick and the opening below quite close, so that little or no light gains access to the cavity. This gall matures its inhabitants about one week or ten days later than does gall No. 1, which were at this time almost all gone, while these are only just commencing to develop the perfect insect.

Dactylosphæra conicum, n. sp.

WINGED IMAGO.—Yellowish-white; head yellow, with a blackish line between the eyes; a dusky band around the thorax; antennæ and legs pale; wings whitish-hyaline, lying flat on the back in repose; antennæ 3-jointed, the last joint long, subclavate, terminated by two minute points; tarsi with one joint, two claws and two digituli, the latter having fine subglobular ends; abdomen slender, pointed. Length .05—.06 inch.

Galls on the Bitter-nut Hickory (C. amara).

GALL No. 6.—Subglobular galls, varying in size from a quarter of an inch to one inch in diameter, the average being about half an inch, situate on leaf or its stems or mid-ribs; color greenish-white, sometimes with a blush of red on one side. The opening is beneath, in the shape of a small, elongate slit, which at length cracks open, like a chestnut burr, in three or four long slits running up the sides; after this the gall soon turns black and dries away. The cavity within is capacious, the walls being about $\frac{1}{4}$ in thickness.

On June 17th I observed thousands of these galls and took home a large botanical box full for study. They were so numerous as to injure the growth of the trees. Those galls that had not yet begun to open, and within which no parasites had gained access, were so thickly studded with young lice, that their abdomens pointed directly inward towards the centre, resembling the crystals in a geode, being wedged in as densely as mosaic work, while the whole central cavity was crowded with winged imagos; the former held on with great tenacity, while the latter were easily shaken out. In one gall I counted as many as one thousand inhabitants. At this time (June 17th) many of the galls had cracked open and the winged imagos were escaping in immense num-

bers. No eggs were found.* The larvæ were pale greenish-yellow.

On June 25th the galls were all dry, black and deserted.

***Dactylosphæra caryæ-magnum*, n. sp?**

? *Pemphigus caryæ-caulis*, Fitch, 1st N. Y. Rep. p. 155.

WINGED IMAGO.—Head and thorax brownish or black; abdomen pale lemon-yellow; prothorax, sometimes the whole thorax, yellow; antennæ and legs dark gray; wings hyaline, iridescent, lying flat on the back in repose; under a high magnifying power the antennæ appear slightly rugose, hairless, 4-jointed, the last joint terminated by two minute spines; and the legs appear corrugated, showing minute rings, and are slightly hairy; tarsi with one joint and two claws; stigma dark and conspicuous. Length of body .06; to tip of wings .08 inch.

GALL No. 7.—Small round galls, generally very numerous in the leaves, and in some cases almost entirely covering them, a single leaf sometimes containing upwards of 250 galls; the average size larger than those of No. 8, although often quite as small, the larger ones measuring three-sixteenths of an inch in diameter. They were (June 25th) quite hard and smooth, and present, especially above, a bright shining appearance; They were quite thick and plump, the vertical diameter compared with the horizontal diameter being as 2 to 3, and were much more plump and elevated above the leaf than those of No. 8. The portions of the leaf between the galls had in some cases turned crimson. I found from three to twenty-five inhabitants in a gall; the round opening beneath was so close as to be pretty safe against enemies, as I found none in the galls opened thus far. Larvæ and pupæ whitish, with red eyes; mother insect cinnamon color and smaller than the pupa.

On July 5th, I found winged imagos in all the galls, large and small, that were opened, the smallest galls not much exceeding .05 inch in diameter; when opened, the young insects eagerly ran out, and all presented the same pale, translucent appearance, with minute dark spots on the anterior part of the body, which is in contrast with the inhabitants of gall No. 8. The winged imago was first observed on June 30th.

***Dactylosphæra minimum*, n. sp.**

WINGED IMAGO.—Body, antennæ and legs, pale yellowish-white; the head and a band round the thorax, dusky; wings on the back in repose, translucent, venation obsolete, the stigma scarcely perceptible. Length of body .025—.03; to end of wings .045—.05 inch.

These insects are much smaller, paler in color and less disposed to fly than any of the other species noticed in this paper. From a gall

* The eggs were found in 1869; see Note below, p. 396.

.05 inch in diameter, I took a single winged imago with body .025 inch in length; with it there were a few eggs, but no other insect. I verified this same circumstance in several other small galls of this species, and it therefore appears probable that the winged imago was the mother-insect, developed into the winged state, although we have heretofore considered them as males.

On the surface of the leaves bearing these galls, were observed numerous, small unknown acarians, in all stages of development, from the egg to the perfect insect. They somewhat resemble a species found abundantly on the White Maple.

GALL No. 8.—Resembles gall No. 7, but generally smaller, less firm, more leathery and pliable, less rounded above, and some yellow in color. They are very numerous, having counted as many as eight hundred on a single leaf; where they are thus crowded together, they are very small, say from .25—.10 inch, in diameter.

On June 9th the eggs were hatching and the young could be seen running about on the leaves as well as in the galls. The mother insect was then a pale yellowish, subglobular mass, length .02 inch.

On July 23rd, I found the galls still containing both eggs and larvæ, the older galls becoming uninhabited, while up on the top limbs and young shoots, the new galls were becoming so numerous as to interfere with the growth of the leaves, and it appeared impossible for the galls to develop.

Although I have never succeeded in finding a winged imago, after having examined hundreds of galls, I presume it to be identical with the species mentioned by Mr. Walsh, (*Proc. Ent. Soc. Phil.* vi, '283), as *caryæ-semen*. Should it not prove to be a variety of *D. globosum*, the name will be as follows:

Dactylophæra caryæ-semen.

caryæ-semen, Walsh, MS. *Proc. Ent. Soc. Phil.* vi, p. 283.

For a description of the gall, egg, larva, and mother insect, see my paper in *Proc. Acad. Nat. Sci.* Jan. 1867, where I included it under *D. globosum*; because, although the galls were of different size, I could not detect any difference in the eggs, larvæ and mother insect, and for other reasons there assigned. It must be admitted, however, that the similarity of the inhabitants, same color of eggs, and lateness of development of both galls are characters of great weight; and Mr. Walsh, in his First Report on the Noxious Insects of Illinois, says that the anatomical differences between the galls of his *caryæ-globuli* and *caryæ-*

semen are quite well marked, the former opening with a slit and the latter with a round nipple-like projection, &c. &c.

GALL No. 9.—On the same leaves containing the small galls, Nos. 7 and 8, I observed a number of larger ones with a dimpled depression above (which may be caused by the collapse of the thin paper-like centre), an opening beneath by a rounded, downy orifice, and having a diameter of .05—.33 inch, and a vertical depth of .12—.16 inch; all contained the female and her eggs, and some larvæ.

***Dactylosphæra foreatum*, n. sp.**

WINGED IMAGO.—Abdomen and prothorax pale orange, with a dark band or ring around the mesothorax; wings carried flat on the back in repose, hyaline, veins small, stigma very faint, smoky; antennæ 3-jointed, the last joint long, subcylindrical and on a very long pedicle; abdomen quite pointed. Length to tip of wings .06; of antennæ .035 inch.

MOTHER INSECT.—Pale yellow, palest posteriorly. Length .04; width .02 inch.

On June 20th the winged imagos were very plenty, but no eggs could be found.

GALL No. 10.—This is the gall of my *D. globosum*, described at length in *Proc. Acad. Nat. Sci. Phil.*, Jan. 1867, and, with No. 8, are the only known Hickory galls that have the character of being soft and leathery in structure. The perfect insect was found between Sept. 20th, and Oct. 20th 1866, since which time I have not seen it. I then described it as being found on what I supposed to be *Carya glabra*, but which now proves to be *C. amara*. See below.

This is so manifestly distinct from *caryæ-globuli*, Walsh, that a comparison is uncalled for; the latter is said to mature in June, while *globosum* matures in October; and the opening of the galls are quite different in shape, that of *globosum* being rounded and on a nipple-like projection, while that of *caryæ-globuli* is an elongated slit.

I am not at all certain that Gall No. 8, is specifically distinct from this.

I found all the above mentioned galls, excepting Nos. 7, 8 and 9, dry and depopulated on July 6th; and on July 21st, 22nd and 23rd, I made a careful examination of all the species of galls here enumerated while yet on the trees, and found them all dry and depopulated except No. 8 and a few of No. 9, which although entirely free from their legitimate inhabitants, were yet green and quite firm, and in each of them I found a pupa of some unknown parasite. This is quite an interesting circumstance and shows how admirably nature provides for the life of all things, in the instance of this gall maintaining its integrity so much beyond the normal time, for the preservation of an intruder!

I have made the foregoing descriptions of the several species of *Dactylosphæra*, excepting No. 1, quite brief, because of the general similarity of the perfect insect; yet, the difference in the anatomical structure of the galls, the season of their development, the different sizes and shades of color of their inhabitants when in the living state—for they all become black and undistinguishable when dry—constitute a sufficient reason for assigning them to different species. That there really is more than one species there is probably no doubt, certainly not with those naturalists who even go so far as to name galls without knowing their legitimate inhabitants.

During the period of my studies of the Hickory galls, I was the constant observer of the various parasites connected with both the gall itself and the inhabitants thereof. The following brief observations I will make:

Parasites of the galls.—1st, In many galls I observed an unknown species of *Thrips*, quite abundant, with red bodies, and antennæ, legs, and tip of tail black. Length .01 inch.—2nd, *Conotrachelus posticus*, Schönh., the larva of which lives in the galls, chiefly of No. 6, often consuming its entire substance; it is a yellowish-white, slightly hairy, footless worm, with head and collar light brown. They had finished feeding and entered the ground about last of June, and the imagos appeared on July 21st. This is probably the same species with Dr. Fitch's *C. elegans* (1st N. Y. Report, p. 156).—3rd, The larva of *Anthonomus erythropus*, Say, was also found within some of the galls; it is a white, rugose, footless, quick-motivated worm about .20 inch in length; it transforms within the gall; the pupa is white, back much curved, tail sharply pointed, and has a number of short reddish bristles about the head and tail; it wriggles about very rapidly when disturbed. 4th, Larvæ of the following new species of *Grapholitha* were found in August and September living in the nut of *Carya amara* (Bitternut Hickory); they destroy the interior of the nut, causing it to fall to the ground; the imago appeared in the latter part of November, it therefore hibernates in this state and continues to live in the spring until sometime in June, when the nut is sufficiently developed to receive the egg.

***Grapholitha caryae*, n. sp.**

Palpi whitish except the minute third joint which is blackish. Head ashy grey, scales long, especially on the occiput. Thorax and abdomen blackish; patagia with a bluish tinge and a few pale scales posteriorly. Anterior wings dark brown, with numerous ferruginous scales, most prominent on and beyond

the middle. Anterior margin with short whitish streaks from near the base to the apex where they are most distinct. A diffuse rounded dark brown patch in the outer third of the wing is filled in with blackish scales. Fringes dark, blackish. Posterior wings above grey anteriorly, posteriorly bluish-black; beneath blackish with a greyish center. Under surface of thorax and legs clothed with whitish scales. Expanse .52 inch; length of body .23 inch. Two male specimens bred.

Parasites of the gall-lice.—The larvæ of certain Syrphidæ were frequently found especially in the larger galls; none were bred to maturity. The larvæ of two species of *Leucopis* were also found feeding upon the young lice; one species, which was white or yellowish-white, sometimes as many as fifty were found in one gall; the other species was red and quite similar to the new species of *Leucopis* I bred from the "grape-leaf louse" (*Pract. Entom.* ii, 17), and which has since been described by Dr. Loew, under the name of *simplex*. Two unknown species of Chalcis-flies were also bred.

From the inmates of some of the galls I also bred a species of *Cecidomyia*, having the following characters:—Body fuscous, pubescent; anterior part of abdomen imperfectly banded with black; antennæ reddish, covered with grey hairs; wings light fawn color, spotted with dusky, the spots arranged in little arcs, forming three broken bands; femora reddish; tibiæ banded with black and white; halteres reddish, on a white pedicel. Length of body one-sixteenth of an inch. Should this species prove to be new, it may be called *C. cossæ*.

In support of the assertion made on page 393, concerning *Carya glabra* and *amara*, the following observations are here added:

In October, 1868, after examining with great care, the fruit of the hickories in the region of Mt. Carroll, I became convinced that besides *Carya alba*, we only have in this place *C. amara*. I have had an opportunity of examining these hickories in this and some adjoining counties, and find no nut that agrees with *glabra*. I had been long aware, both from reports of mechanics and from personal observation, that the young hickory sapling here is not so tough for hoops and withes as those in Pennsylvania, where the true pignut hickory is abundant; but the nut itself is the best guide to correct determination.

The kernel of the nut of *C. amara* is always quite bitter, and much corrugated, shell so thin that it is easily broken with the teeth, and I have broken the whole nut with my hand; any of them can easily be cut in halves with a knife, and then readily crushed in pieces with the fingers. The stigmatic extremity usually projects into a long sharp spine; husk thin and leathery-like, soft, split from the apex only about half way to the base; 3 to 5, usually only 4, prominent hinged sutures at the upper end; this last character is not persistent, but gradually disappears in a series of specimens, so as to be entirely absent in the nuts of some trees. The form of the nut varies between cordate and oblong-ellipsoidal; leaflets 7—9—11; bark at first smooth, but as the tree grows older it

becomes rough and corrugated. The trees seldom attain more than a foot in diameter. Winter bud small, slender, not smooth, yellowish. Abundant in the prairie groves and copses on the low bank of water courses.

There appears to be two varieties of the *C. amara*. In the usually described variety, the leaf is immaculate, and to this the gall No. 6 is entirely confined. In the other, the leaf is sprinkled with small, grey, glandular dots beneath, which remain persistent during the summer, and to this the galls No. 7 and 8 are exclusively confined.

The peculiar choice of these insects, would lead us to believe that the tree with the dotted leaf may be a new and distinct variety; but I have not yet made a sufficient examination of the fruit to decide this point. Nuts found on the trees bearing gall No. 7, do not materially differ however from those of the tree bearing gall No. 6.

I have never yet found the fruit of a tree bearing gall No. 8, but judging from the leaf, bud and bush, I know it to be identical with the trees bearing gall No. 7. Neither did I find galls Nos. 7 and 8 on one and the same tree. The locality of gall No. 7 was a mile from that of gall No. 8. The trees are in all respects similar, both having the small dots under the leaf, and very probably the galls will be found together.

This tree, with the thick sprinkling of small grey dust-like glands beneath the leaf, may be designated as *Carya amara-glandula*, by way of distinction, at least to answer the purposes of entomological research.

I spent the 4th of November 1868, at Rock Island—a portion of the morning on the Island, and the afternoon among the bluffs to the eastward of the city—examining the hickory trees and their fruit. I found, *C. alba*, *C. amara*, and a solitary tree of *C. tomentosa*, I did not see a single tree of *C. glabra*.

To render my determination of *C. amara* more certain, I carried with me to Columbia College, New York City, a number of the nuts for comparison with the specimens in the collections there; and through the kind assistance of Dr. Torrey, Professor of Botany at the college, and Mr. LeRoy of Peekskill, it becomes entirely positive that the nuts gathered, both in the vicinity of Rock Island and of Mt. Carroll, are those of *C. amara*; and that there are no fruit bearing trees, and therefore probably none of the *C. glabra*, in either of those localities.

Mt. Carroll, Ills., April, 1869.

NOTE.

During the summer of 1869 I made the following observations on Hickory Galls in the vicinity of Mt. Carroll:

June 18th.—Gall No. 6 already had winged imagoes and eggs, the latter were not found last year. They were translucent-whitish, abundant, length .005 inch. The first gall observed contained two mother insects.

June 20th.—Gall No. 9 was far more abundant than last year and

some of them twice as large, their width being from 3-16th to 6-16ths of an inch. Gall No. 8 were found to be very numerous on the same trees as last year.

June 29th.—I confirmed the observations I made on the various galls last year, and discovered two new species, described below under Nos. 11 and 12. Gall No. 6 were very numerous and much more abundant than last year, sometimes a dozen was found on a single leaf, destroying it and often much injuring the tender branches. The weather was entirely too wet for the health of the inhabitants, and they were also found to be greatly afflicted with parasites as well as disease, and comparatively few reached the perfect state, compared with the millions of last year. Even the curculio larvæ, so abundant in these galls, were found to be much preyed upon by a species of chalcis-fly, and at this date I found plenty of eggs in some of the latest developed galls.

In the early part of the gall-season I observed many specimens of the *Thrips*, that infest them, on the leaves and some in the act of forcing an entrance into the galls. I also observed specimens of *Anthonomus erythropus*, Say, on the leaves seeking the galls, and even found one with its abdomen inserted into the opening of a gall, evidently in the act of ovipositing. Some pale amber colored eggs, half the size of those of the plant-lice (evidently deposited by some intruder) were also observed.

Gall No. 11.—Very thick, depressed, slightly elevated above the leaf, conical below; contained many larvæ and yellow pupa, but at this date (June 18th) too late to find the eggs. This gall is almost like No. 4, with the walls much thicker.

***Dactylosphæra coniferum*, n. sp.**

Body brownish; abdomen, and in some specimens the mesothorax, pale yellow; antennæ three-jointed, the last joint very long and on a slender pedicel; tarsi very long, with the two digituli almost as long; claws two, as usual; wings ample, carried flat in repose, neuration nearly undefinable, stigma slightly clouded. Length of body .025; to tip of wings .05—.04 inch.

Many specimens observed.

GALL No. 12.—Yellowish, pubescent, covered with spines, quite irregular; opening beneath elongate, sinuate. This gall, from its being spinose and irregular, is quite in contrast with all the others of the series.

***Dactylosphæra spinosum*, n. sp.**

WINGED IMAGO.—Head and thorax black or brownish; abdomen yellow; antennæ four-jointed, the third joint much shorter than fourth, tipped with a hairy spine; tarsi long; wings carried flat in repose. Length of body .03; to tip of wing .06 inch.

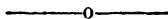
PUPA.—Color, light orange; back covered with long spines—quite in contrast with the pupæ of the other species which are all smooth.

LARVA.—Pale yellowish, abdomen covered with spines.

EGG.—Elongate-ovate, twice as long as wide, pale translucent greenish. Length .008 inch.

This is an interesting example among this series of galls, wherein the gall and young differ much more evidently than does the imago. The spiny gall and prominent spiny tubercles covering the body of the young, widely separates it from the preceding species, and yet the imago has much the appearance of that inhabiting the other galls. This is a strong, if not conclusive, argument in favor of the validity of the several species proposed.

Mt. Carroll, Ills., October, 1869.



ERRATA.

Page 103, line 31, for *nastutus* read *nasutus*.

128, line 1, for *an* read *and*.

224, line 41, for *verticalis* read *ventralis*.

280, line 34, for *Tears* read *Teras*.

385, line 11, for *Chrysopa* read *Chrysopa*.

385, lines 21 and 22, for *terinatus* read *terminatus*.